

09/28/00
JC920 U.S. PTO

10-02-00

A

Practitioner's Docket No. PGI 40028

PATENT

JC841 U.S. PTO
09/675076
09/28/00

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.' " M.P.E.P. § 601, 7th ed.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Sorin Crainic

WARNING: 37 C.F.R. § 1.41(a)(1) points out:

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): High Bulk Non-Woven Composite Fabric

CERTIFICATION UNDER 37 C.F.R. § 1.10*

(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date Sept. 28, 2000 in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL597596689US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Kristine Carroll

(type or print name of person mailing paper)

Kristine Carroll

Signature of person mailing paper

WARNING: Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

***WARNING:** Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

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1. Type of Application

This new application is for a(n)

(check one applicable item below)

- ☒ Original (nonprovisional)
☐ Design
☐ Plant

WARNING: Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

WARNING: Do not use this transmittal for the filing of a provisional application.

NOTE: If one of the following 3 items apply, then complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED** and a **NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION**.

- ☐ Divisional.
☐ Continuation.
☐ Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(f) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED**.

WARNING: If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.

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WARNING: When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).

- ☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

8 Pages of specification

6 Pages of claims

1 Sheets of drawing

WARNING: DO NOT submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c).

(complete the following, if applicable)

- ☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).

☒ formal

☐ informal

B. Other Papers Enclosed

_____ Pages of declaration and power of attorney

_____ Pages of abstract

_____ Other

4. Additional papers enclosed

☐ Amendment to claims

- ☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☐ Information Disclosure Statement (37 C.F.R. § 1.98)

☐ Form PTO-1449 (PTO/SB/08A and 08B)

☐ Citations

- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☒ Other Provisional

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

NOTE:- A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

NOTE: "The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.62, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors." 37 C.F.R. § 1.41(a)(1).

- ☐ Enclosed
- Executed by

(check all applicable boxes)

- ☐ inventor(s).
- ☐ legal representative of inventor(s).
37 C.F.R. §§ 1.42 or 1.43.
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
- ☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

- ☒ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

- ☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of all the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

- ☐ Showing that the filing is authorized.
(not required unless called into question. 37 C.F.R. § 1.41(d))

6. Inventorship Statement

WARNING: If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☒ The same.

or

- ☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,
- ☐ is submitted.
- ☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

- ☒ English
- ☐ Non-English
- ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

8. Assignment

☐ An assignment of the invention to Polymer Group, Inc.

☐ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☒ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters—one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

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9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

- ☐ is (are) attached.
☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. § 1.16)

A. ☒ Regular application

CLAIMS AS FILED						
Number filed	Number Extra		Rate		Basic Fee 37 C.F.R. § 1.16(a) \$690.00	
Total Claims (37 C.F.R. § 1.16(c))	28	- 20 =	8	×	\$ 18.00	\$ 144.00
Independent Claims (37 C.F.R. § 1.16(b))	3	- 3 =	0	×	\$ 78.00	0
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))				+	\$260.00	

- ☐ Amendment cancelling extra claims is enclosed.
☐ Amendment deleting multiple-dependencies is enclosed.
☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation \$ 834.00

B. ☐ Design application
(\$310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation \$

- C. ☐ Plant application
(\$480.00—37 C.F.R. § 1.16(g))

Filing fee calculation

\$ _____

11. Small Entity Statement(s)

- ☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

WARNING: "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

WARNING: "Small entity status must not be established when the person or persons signing the . . . statement can unequivocally make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).

(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application
_____ / _____, filed on _____, from which benefit
is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)

\$ _____

NOTE: Any excess of the full fee paid will be refunded if small entity status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☐ Not Enclosed

☐ No filing fee is to be paid at this time.

(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Filing fee \$ 834.00

☐ Recording assignment
(\$40.00; 37 C.F.R. § 1.21(h))
(See attached "COVER SHEET FOR
ASSIGNMENT ACCOMPANYING NEW
APPLICATION".) \$ _____

☐ Petition fee for filing by other than all the
inventors or person on behalf of the inventor
where inventor refused to sign or cannot be
reached
(\$130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) \$ _____

☐ For processing an application with a
specification in
a non-English language
(\$130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) \$ _____

☐ Processing and retention fee
(\$130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) \$ _____

☐ Fee for international-type search report
(\$40.00; 37 C.F.R. § 1.21(e)) \$ _____

NOTE: 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed \$ 834.00

14. Method of Payment of Fees

☒ Check in the amount of \$ 834.00

☐ Charge Account No. _____ in the amount of
\$ _____

A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

Variable	Mean	SD	Min	Max	Skewness	Kurtosis	Normality
Age	38.5	12.5	25	65	0.1	3.2	0.95
Gender	1.2	0.4	1	2	0.0	3.0	0.98
Marital Status	1.5	0.5	1	3	0.2	3.1	0.96
Education	12.5	2.5	9	16	0.3	3.3	0.94
Income	15000	5000	10000	25000	0.4	3.4	0.93
Health	1.8	0.6	1	3	0.1	3.2	0.95
Stress	2.5	0.8	1	4	0.2	3.1	0.96
Depression	1.5	0.5	1	3	0.1	3.2	0.95
Life Satisfaction	3.5	0.8	1	5	0.3	3.3	0.94
Work Satisfaction	3.0	0.7	1	5	0.2	3.1	0.96
Family Satisfaction	3.8	0.9	1	5	0.3	3.3	0.94
Community Satisfaction	3.2	0.7	1	5	0.2	3.1	0.96
Overall Satisfaction	3.3	0.8	1	5	0.2	3.1	0.96

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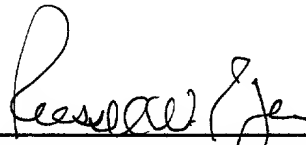
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16. Instructions as to Overpayment

NOTE: "... Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ Credit Account No. 10.1324

☐ Refund



SIGNATURE OF PRACTITIONER

Reg. No. 23.076

Russell W. Pyle

(type or print name of attorney)

Tel. No. (312) 236-8123

221 N. LaSalle St., Suite 850

P.O. Address

Customer No. IDON302826

Chicago, IL 60601

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☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

- ☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

- ☒ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added 1

- ☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

- ☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☐ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

- ☐ This transmittal ends with this page.

**ADDED PAGE(S) FOR SPECIAL COMMENTS FOR NEW APPLICATION
TRANSMITTAL**

17. Relate Back

- A. The present invention claims priority based on U.S. Provisional Application Serial No. 60/157,689, filed October 5, 1999. Inventorship for this application is identical to that of Provisional Application No. 60/157,689.

Added page_____

(Added Page(s) for Special Comments for New Application Transmittal [4-1])

HIGH BULK NON-WOVEN COMPOSITE FABRIC

CROSS REFERENCE

The present invention claims the priority of U.S. Provisional Application No. 60/157,689, filed October 5, 1999.

FIELD OF THE INVENTION:

The present invention relates to non-woven fabrics having high bulk. In particular, the present invention relates to composite non-woven fabrics having a high bulk layer attached to a non-woven substrate layer.

BACKGROUND OF THE INVENTION:

The prior art contains examples of non-woven fabrics useful as wipes, towels, or other absorbent articles. These fabrics may combine a non-woven absorbent layer with a non-woven substrate layer for structure and strength. In one type of prior art non-woven absorbent, a high loft, low density layer is combined with a hydroentangled substrate web.

The resulting fabric is desirable in that it offers the high loft and low density associated with the first layer in combination with the generally soft hand of the hydroentangled substrate layer, as is desirable, for example, when used as a baby wipe.

These prior art fabrics, however, have several unresolved problems associated with them. In particular, when attaching the high loft layer to the hydroentangled substrate non-woven layer, it has been difficult to maintain the first layer's high loft and bulk. In order to achieve its loft, the first layer is typically air laid. Methods for subsequently attaching the first layer to the substrate layer have generally included hydrostitching and

hydroentangling. These methods, however, result in a wetting of the air laid high loft layer and a resultant permanent compression and densification thereof.

In addition to problems associated with composite fabrics having an air laid layer, problems also exist with prior art air laid non-woven layers in and of themselves. In particular, such fabrics have heretofore suffered from excessive dusting and linting.

Several unresolved problems therefore exist relating to non-woven fabrics having a high loft and high bulk component.

OBJECTS OF THE INVENTION:

It is an object of the invention to provide a non-woven composite fabric having a non-woven substrate layer thermally bonded to a high loft absorbent layer.

It is a further object of the invention to provide a method for producing a composite non-woven fabric having a high loft absorbent layer and a non-woven substrate layer.

DESCRIPTION OF THE INVENTION

The method generally comprises the steps of providing a hydroentangled non-woven layer having a first binder component, and depositing a second non-woven layer having a high bulk and loft on to the hydroentangled layer to form an unbonded composite fabric. The second layer also has a binder component with a melting temperature substantially equal to the first binder melting temperature.

The unbonded composite is then thermally bonded with air heated to a temperature in the range of the melting points of the first and second binder fibers. The thermal

bonding step may comprise air drying of the composite to remove moisture from the hydroentangled layer. Also, the bonding step may comprise heating in an oven. As they begin to melt, the binder fibers from each layer flow at least partially across the interface between the two layers. In this manner, the layers are simultaneously stabilized and the composite is bonded together without densifying any of the layers. Advantageously, bonding between layers thereby takes place without any wetting of the high bulk and loft layer, thereby preserving its loft and bulk qualities.

An embodiment of the method of the invention as described above is illustrated schematically in Figure 1. A first web 2 is hydroentangled at hydroentangling station 4. Web 2 comprises at least a binder fiber portion. Web 2 may be hydrophobic or hydrophilic. Preferably, the first web layer 2 comprises staple rayon fibers hydroentangled together with binder fibers. The staple rayon fibers preferably comprise 60-85% by weight of the layer, and are between about 1.7 – 6 dtex and about 30-70 mm in length. Binder fibers preferably comprise between about 15 - 40% by weight of the layer. Prior to hydroentangling, a staple fiber batt may be prepared by any means as are known in the art, including, by way of example, carding, randomization, and air laying. The batt is then hydroentangled by any method as are generally known in the art. An example of a hydroentangling method is described in U.S. Patent No. 3,485,706 to Evans, herein incorporated by reference. The hydroentangled web 2 has a preferred basis weight in the range of 10-100 gm/m², with 20-70 gm/m² most preferred.

Hydroentangled web 2 may then be pre-dried under vacuum in drier 6. This step of pre-drying is optional.

Forming heads 8 then deposit a high loft second web 10 on first web 2 to form un-bonded composite 12. Preferred second layer 10 comprises 60-85% by weight pulp and 15-40% by weight binder fiber. The most preferred pulp is Southern Kraft, as is known in the art. Preferably, the second layer 10 is air laid substantially dry. An example of air laying is provided in U.S. Patent No 3,692,622 herein incorporated by reference. The second web has a preferred basis weight in the range of 10-100 gm/m², with 20-70 gm/m² most preferred. The second layer 10 may be deposited on either side of the hydroentangled first layer 2, and may be in the form of a prepared tissue sheet, as an airlaid mat applied directly to the staple web surface, or as an airlaid web provided on a forming wire. The two webs 2 and 10 are provided in a preferred weight ratio of about 1:1, with an operable ratio of between 1:4 to 4:1.

The binder fibers for both web layers 2 and 10 preferably comprise bicomponent fibers having polyethylene as the outer layer with one of either poly(ethylene terephthalate) or polypropylene as the inner layer. Bicomponent fibers are preferred over homogenous fibers as bicomponent fibers will lose only part of their structure during melting, with the remaining member able to participate in the fabric structure and add resiliency. Sheath-core and side by side bicomponent fibers may be used. Binder fibers are preferably 30-70 mm in length, and 1.7-6 dtex. Most preferred binder fibers are 40-60 mm in length, 2.2 dtex, and comprise 20% by weight of the respective layer. Binder fiber components of both webs 2 and 10 have substantially equal melting temperatures, which are generally low and preferably in the range 129 – 134 °C for the polyethylene portion.

The two layers 2 and 10 of un-bonded composite web 12 are then bonded to one another by passage through ovens 14, which operate at a temperature in the range of the

binder fiber melting temperatures. At least a portion of the binder components of the two layers melt in oven 14 and flow into the fiber crossover junctions of the individual webs and into the layer interface region. In this manner, the layers are simultaneously stabilized and bonded to one another without densifying either of the layers. Bonded composite fabric 16 results, which retains the high loft quality of web 10.

In a most preferred embodiment of the method of the invention, the pre-drier 6 of Fig. 1 is eliminated, and high loft web 10 is directly air laid dry onto wet hydroentangled web 2. Bonding of the unbond composite web then takes place simultaneously with drying of web 2 in oven 14, which may comprise a drier. By combining drying with bonding, this most preferred embodiment of the method of the thereby provides a significant manufacturing cost and time savings.

In an additional embodiment of the invention, a second hydroentangled web is provided on the exposed side of the high loft layer prior to the thermal bonding step. An unbonded composite is thereby formed with the two hydroentangled layers sandwiching the high loft layer. The second hydroentangled web is substantially the same as the first, with a binder component also as described in relation to the previously described binders. The unbonded composite is then thermally bonded with air heated to a temperature in the range of the binder fiber melting point. This results in the binder component of all three layers melting and flowing at least partially across the layer interfaces. In this manner, the layers are simultaneously stabilized and the composite is bonded together without densifying any of the layers. The resultant bonded composite fabric retains the high loft of the pulp layer, as well as having greatly reduced linting and dusting characteristics over the high loft fabric alone or in combination with a single hydroentangled layer.

has a preferred basis weight in the range of 10-100 gm/m², with 20-70 gm/m² most preferred. The second layer may be deposited on either side of the hydroentangled first layer, and may be in the form of a prepared tissue sheet, as an airlaid mat applied directly to the staple web surface, or as an airlaid web provided on a forming wire. The two webs are present in a preferred weight ratio of about 1:1, with an operable ratio of between 1:4 to 4:1.

The binder fibers for both layers of the fabric of the invention preferably comprise bicomponent fibers with a polyethylene outer layer and one of either poly(ethylene terephthalate) or polypropylene as an inner layer. Bicomponent fibers are preferred over homogenous fibers as bicomponent fibers will lose only part of their structure during melting, with the remaining member able to participate in the fabric structure and add resiliency. Sheath-core and side-by-side bicomponent fibers may be used. Binder fibers are preferably 30-70 mm in length, and 1.7-6 dtex; most preferably 40-60 mm in length, 2.2 dtex, and they comprise 20% by weight of the respective layer.

In an additional embodiment of the fabric of the invention, a second hydroentangled web is bonded to the exposed side of the high loft layer, with the high loft layer thereby sandwiched between the two hydroentangled layers. The second hydroentangled web is substantially the same as the first, with a binder component also as described in relation to the previously described binders. The binder fiber component extends at least partially over a layer interface and into the high loft layer to thereby bond the two layers together. In this manner, the three layers are simultaneously stabilized and the composite is bonded together without densifying any of the layers. The resultant bonded composite fabric retains the high loft of the pulp layer, and shows greatly reduced

linting and dusting characteristics over the high loft fabric alone or in combination with a single hydroentangled layer. Such a fabric may prove particularly useful as a baby wipe.

It is to be understood that the disclosure is not limited in its application to the details of the construction and the arrangements set forth in the following description or illustrated in the drawing. The present invention is capable of other embodiments and of being practiced and carried out in various ways, as will be appreciated by those skilled in the art. Also, it is to be understood that the phraseology and terminology employed herein are for description and not limitation.

Claims:

What is claimed is:

1. A method for preparing a composite non-woven fabric comprising the steps of:
 - a) providing a non-woven hydroentangled substrate web layer having a first binder fiber component, said first binder fibers having a desired melting temperature range;
 - b) depositing a second non-woven layer on said first layer to form an unbond composite, said second layer having a high bulk, high loft fiber component and a second binder fiber component, said second binder fibers having a desired melting temperature range substantially equal to said first binder fiber component melting temperature; and
 - c) thermally bonding with a heated gaseous medium said unbonded composite, said gaseous medium heated to a temperature in the range of said first and second binder fiber melting temperature; said first and second binder fiber components at least partially melting and flowing into an interface region between said first and second layers; and cooling said layers; said layers thereby stabilized and bonded together without increasing the density of either layer.
2. A method as in claim 1, wherein said first layer comprises hydroentangled staple fibers.
3. A method as in claim 1, wherein said first layer comprises 60-85% rayon fibers, and 40-15% of a bicomponent binder fiber.

4. A method as in claim 3, wherein said bicomponent binder fiber comprises an outer layer of polyethylene and an inner layer chosen from the group consisting of poly(ethylene terephthalate) and polypropylene; and wherein said bicomponent fiber is 30-70 mm in length, and 1.7-6 dtex.
5. A method as in claim 1, wherein said second layer comprises a mixture of 60-85% by weight pulp and 15-40% by weight of said second bicomponent binder fibers, and wherein said second bicomponent binder fiber comprises an outer layer of polyethylene and an inner layer chosen from the group consisting of poly(ethylene terephthalate) and polypropylene; and wherein said bicomponent fiber is 30-70 mm in length, and 1.7-6 dtex.
6. A method as in claim 5, wherein said binder fiber has a length of 40-60 mm, and is about 2.2 dtex.
7. A method as in claim 5, wherein said pulp comprises Southern Kraft.
8. A method as in claim 1, wherein said second layer is substantially dry.
9. A method as in claim 1, wherein said first layer is hydroentangled and contains moisture, said second layer is substantially dry, and said step of thermally bonding said layers comprises air drying of said unbonded composite to remove moisture from said first layer.

10. A method as in claim 1, wherein said second layer comprises substantially dry tissue.
11. A method as in claim 1, further comprising the step of providing a third layer, said third layer comprised of hydroentangled staple fibers having a third fiber binder component having a melting temperature substantially equal to said first and second binder fibers, said second layer sandwiched between said first and third layers to form said unbond composite, said unbond composite thermally bonded by heated air at a temperature in the range of said binder fiber melting point.
12. A method as in claim 1, wherein said first and second layers each having a basis weight between about 10-100 gm/m².
13. A method as in claim 1, wherein said first and second layers each having a basis weight between about 20-70 gm/m².
14. A composite non-woven fabric comprising:
- a) A first hydroentangled layer, said layer having at least a first binder fiber component;
 - b) A second layer overlaying said first layer, a layer interface therebetween; said second layer having a high loft, high bulk component and a second binder component having a melting temperature substantially equal to said first binder component; said second binder component extending at least partially across said

layer interface and into said first layer; said first layer binder fiber component extending at least partially across said layer interface and into said first second layer, said first and second layers thereby bonded to one another.

15. A fabric as in claim 14, wherein said first layer comprises hydroentangled staple fibers.

16. A fabric as in claim 14, wherein said first layer comprises between 60-85% rayon fibers, and 40-15% of a bicomponent binder fiber.

17. A fabric as in claim 14, wherein said bicomponent binder fiber comprises an outer layer of polyethylene and an inner layer chosen from the group consisting of poly(ethylene terephthalate) and polypropylene; and wherein said bicomponent fiber is 30-70 mm in length, and 1.7-6 dtex.

18. A fabric as in claim 14, wherein said second layer comprises a mixture of 60-85% by weight pulp and 15-40% by weight of said second bicomponent binder fibers, and wherein said second binder fiber comprises an outer layer of polyethylene and an inner layer chosen from the group consisting of poly(ethylene terephthalate) and polypropylene; and wherein said bicomponent fiber is 30-70 mm in length, and 1.7-6 dtex.

19. A fabric as in claim 18, wherein said binder fiber has a length of 40-60 mm, and is about 2.2 dtex.

20. A fabric as in claim 18, wherein said pulp comprises Southern Kraft.
21. A fabric as in claim 14, wherein said second layer is substantially dry.
22. A fabric as in claim 14, wherein said first layer is hydroentangled and contains moisture, said second layer is substantially dry, and said step of thermally bonding said layers comprises air drying said first layer.
23. A fabric as in claim 14, wherein said second layer comprises substantially dry tissue.
24. A fabric as in claim 14, wherein said second layer comprises pulp.
25. A fabric as in claim 14, further comprising a third non-woven fabric layer, said third layer comprised of hydroentangled staple fibers having a third fiber binder component having a melting temperature substantially equal to said first and second binder fibers, said second layer sandwiched between said first and third layers to form said unbond composite, said unbond composite thermally bonded by heated air at a temperature in the range of said binder fiber melting point.
26. A fabric as in claim 14, wherein said first and second layers each having a basis weight between about 10-100 gm/m².

27. A fabric as in claim 14, wherein said first and second layers each having a basis weight between about 20-70 gm/m².

28. A method of making a high loft non-woven fabric comprising the steps of:

- a) hydroentangling a web, comprised of a binder fiber component;
- b) depositing a substantially dry air laid pulp layer on said hydroentangled web while said hydroentangled web is substantially wet to form an unbonded composite; said pulp layer having a binder fiber component; and
- c) simultaneously drying said hydroentangled web and bonding said unbonded composite by exposing said unbonded composite to heated air, said heated air at least partially melting said binder fiber, said binder fibers at least partially flowing across a pulp layer and web interface and thereby bonding said layer and said web together.

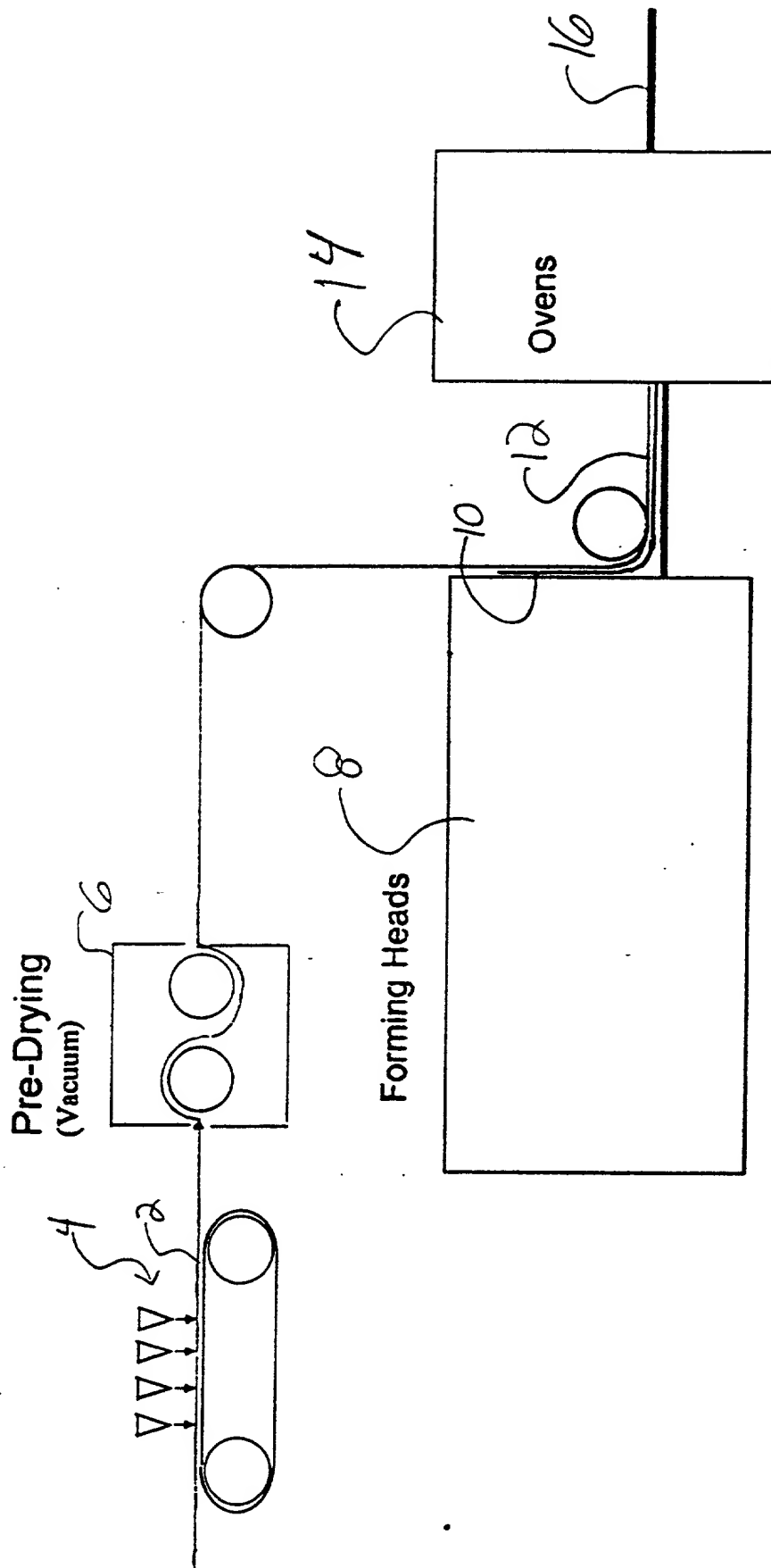


Fig 1